Status of the STAR Event Plane Detector (EPD)

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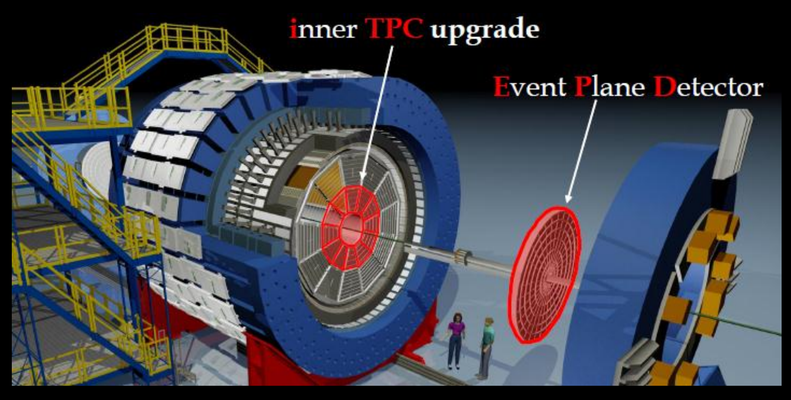
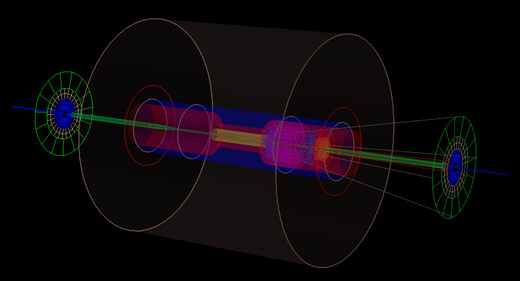
Motivation

- The first phase of Beam Energy Scan (BES) program of the Relativistic Heavy Ion Collider (RHIC) was an exploration of the QCD phase diagram
- During the second phase BES II, scheduled to begin in 2019, STAR will search for evidence of criticality and phase transition signals.
- For the Solenoidal Tracker at RHIC (STAR) a quantitative understanding dedicated hardware projects as well as improved statistics in Au+Au collisions at different energies are needed
- The Event Plane Detector (EPD) is a proposed high η that will replace the current STAR Beam Beam Counter (BBC) with vastly improved granularity
- Will provide improved triggering and event plane/centrality measurements independent of the STAR Track Projection Chamber (TPC)

The Experiment

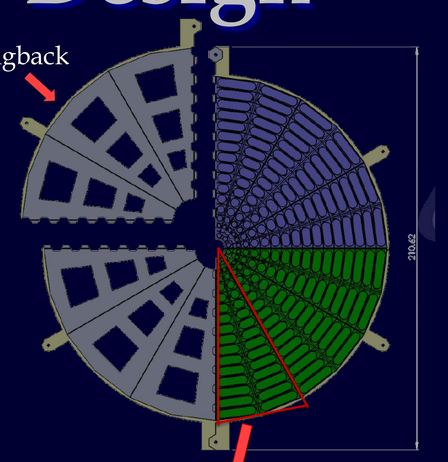


Solenoidal Tracker At RHIC

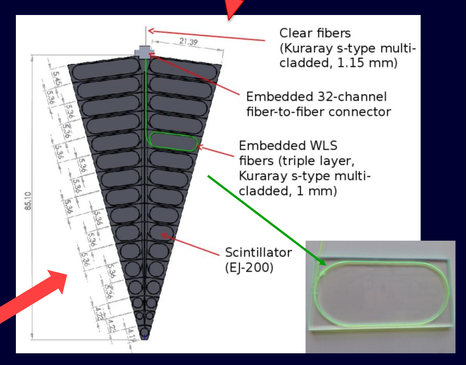


Event Plane Detector

EPD Design

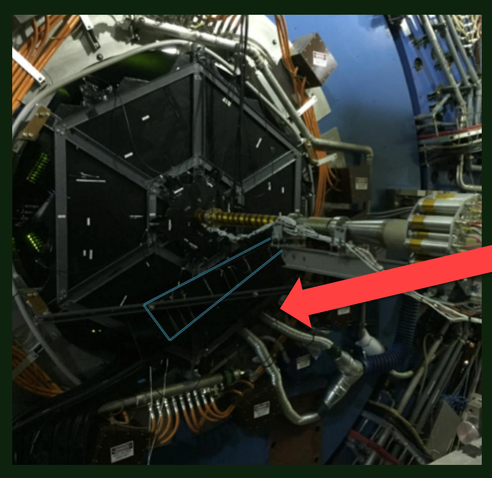


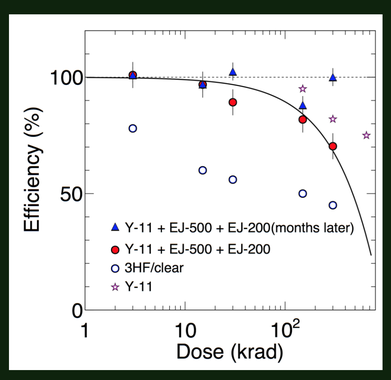
- Consists of four strong- backs milled from 3/8 inch thick fiberglass-reinforced epoxy laminate
- Strongback carries 3 supersectors made by scintillator
- Supersector consists of two sectors divided into 31 separate tiles
- Fibers are routed in central grooves to outer edge connector

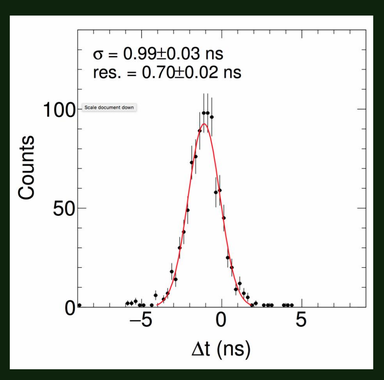


Prototype at STAR

- The EPD prototype was installed at STAR and recorded data in 2016, √sNN = 200 GeV Au+Au
- Wave Length Shifting (WLS) fibers are coupled to clear fibers (reduced attenuation length). All SiPMs are placed behind the magnet to protect them from radiation (~5 m fiber length)
- Consistent result between prototype and test branch setup: 250 photo-electron/MIP
- EPD timing resolution 0.7ns (old detector (BBC) ~1ns)
- Radiaton hardness test has been done at LBNL 88 inch cyclotron and we consider whole set up is radiation hard



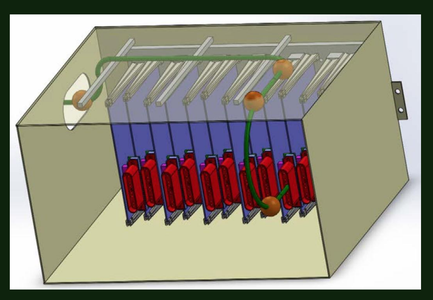




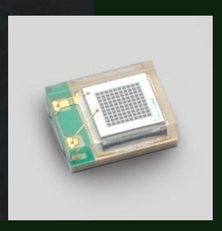
Supersector assembly

- Will install 1/8th of EPD into STAR for run 2017
- 3 supersectors are made by LBNL and OSU (Ohio State University)
- Sillicon Photo Multiplier (SiPM) will be used for readout: 768 channels in total
- FEE has been re-designed to fit existing STAR read out

FEE box

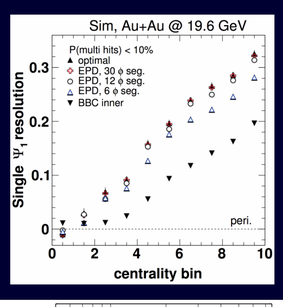


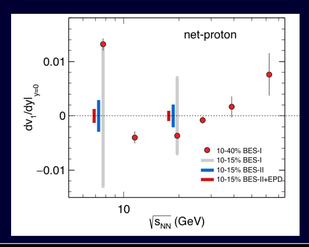
SiPM



Outlook

- The plan for 2017 operations is to commission the EPD:
  -> 1/8th of the detector will be tested in BNL in November 2016
  -> 1/8th of EPD should be installed on one side of STAR before run 2017
- 2018 full installation of all 24 supersectors
  -> Data taking
  -> The statistics (resolution) will be improvement by 40%





Summary

- EPD - high azumithal and radial segmentation - provides better event plane resolution and centrality selection independent from TPC
- R&D is completed and RNC has designed all relevent parts of EPD
- All relevent parts have been built by LBNL, OSU and BNL
- First 1/8th of EPD will be installed in STAR for run 2017
- Full detector will be installed in STAR for run 2018

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